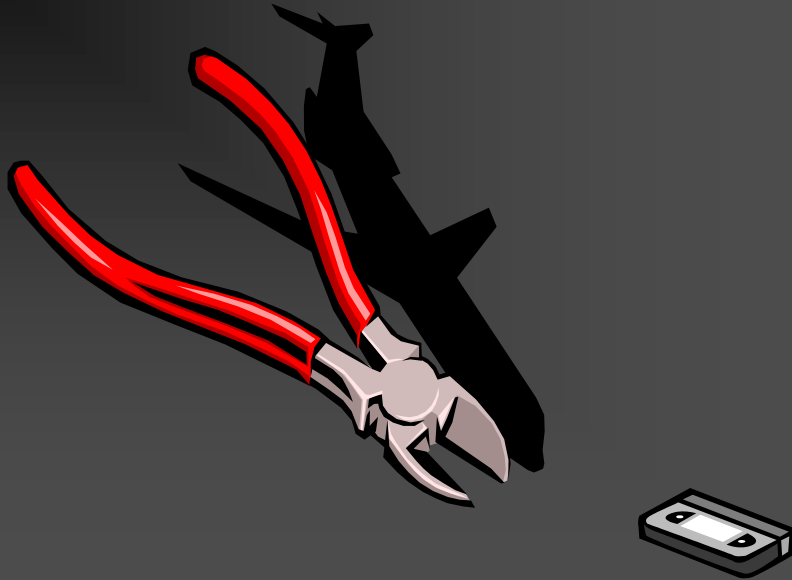


Human Factors In Maintenance



This presentation is to be used to debrief the video, “The Human Factors in Aircraft Maintenance”, and highlight the importance of the “Dirty Dozen” and HFACS-ME (Human Factors Analysis and Classification System- Maintenance Extension).

This film was initially created to provide an example case for the “Dirty Dozen”. However, the factors described in this accident also need to be reported and further analyzed, along with past and future accident and incident reports, for possible trends that may lead to future errors, incidents, and accidents. HFACS-ME provides that capability.

HFACS-ME’s Framework incorporates all of the “Dirty Dozen’s” elements and allows a method to further classify errors into a total of 34 separate categories. HFACS-ME, if used as part of an organization’s standard investigation and reporting system, can more thoroughly investigate, report, and analyze accidents and incidents.

The video can be purchased through Transport Canada’s website or by telephone at:

Civil Aviation Communications Centre

Telephone: 1-800-305-2059

Internet: http://www.tc.gc.ca/aviation/pubs/avreg_e.htm

Human Factors In Maintenance



Maintenance Manager

“Why?” (Systems Approach)

- Recommended new checklist sign-off method to prevent possible future errors.

Shift Supervisor

“Who?” (Blame Approach)

- Lack of Assertiveness with Marketing led to poor scheduling decisions.



Note the different philosophies of the Maintenance Manager and the Supervisor:

The **Maintenance Manager** wants to find out WHY the accident happened to prevent similar accidents. She also acknowledges that people don't just mess up, instead, the organization somehow failed as a whole. She later demanded a checklist change to help prevent future accidents caused by poor tool control procedures (a system intervention vice individual punishment).

The **Supervisor** was only interested in WHO to blame. His prevention strategy consisted of eliminating personnel who “failed”, vice discovering WHY the “best person” made a mistake within this overall organizational failure. He didn't even acknowledge his own scheduling failure that initiated this chain of events.

Human Factors In Maintenance



“The Dirty Dozen”

Lack of:

Communication

Resources

Assertiveness

Awareness

Teamwork

Knowledge

Abundance of:

Pressure

Stress

Norms

Fatigue

Distraction

Complacency

The factors that usually aggravate others are:

Stress

Fatigue

Pressure



The **Dirty Dozen** (shown on slide) provides the factors that may lead to maintainer errors. The film notes that combinations of the Dirty Dozen, vice just one factor, usually lead to accidents. The three most often cited are Stress, Fatigue, and Pressure.

Human Factors In Maintenance



Lead Mechanic

Fatigue (all nighter)

Stress (separated/0630 pick up)

Distraction (phone call/son)

Lack of Resources (additional trained personnel)

Pressure (plane needed in morning)

Lack of Awareness (missed tool)

Norms (paperwork sign-off: "ruler method")

Assistant Mechanic

Helpful, but Lack of Knowledge increased Lead's burden



For example, the film mentions the Dirty Dozen factors that most influenced the Lead Mechanic (Jerry Collins) and his assistant.

Human Factors In Maintenance



SAFETY NETS

Organizational:

Checklists

Procedures

Regulations

Personal:

Tool accountability

Identifying stop points

Health/Rest

Task prioritization/organization

Finding/expecting problems

Situational awareness



The Dirty Dozen philosophy does not only list the factors that affect maintainers, it also highlights the need to implement “safety nets” to prevent their occurrence.

Safety nets can be implemented at the overall organizational level or at the individual/personal level (see slide for examples).

Human Factors In Maintenance



Accident Factors

Tool control/Scheduling/QA
Checklists
Insufficient Maintenance Personnel
No QA inspector/Supervisor went home
Excessive work hours
Stress/Family/“Can do attitude”
Fatigue
Task acceptance
Excessive hours/Shortcuts
Tool partially hidden by equipment
Failed to notice or remember tool
Checklist sign off/Tool inventory
Checklists/Shortcuts

HFACS-ME Categories

Inadequate Processes
Inadequate Documentation
Inadequate Resources
Inadequate Supervision
Inappropriate Operations
Mental State
Physical State
Assertiveness
Adaptability/Flexibility
Obstructed
Attention/Memory
Judgment/Decision Making
Routine Violation (not the 1st time)



The Dirty Dozen tends to focus more on the Maintainer and what he or she should do individually to prevent errors. HFACS-ME provides a broader view to classify all organizational conditions and errors. By investigating, classifying, and reporting all of these factors using HFACS-ME as a guide, an organization is better prepared to understand and prevent future incidents and accidents. Here is an example of how HFACS-ME could be used to classify this same accident:

Accident Factors

Tool control/Scheduling/QA
Checklists
Insufficient Maintenance Personnel
No QA inspector/Supervisor went home
Excessive work hours for unnecessary task
Stress/Family/“Can do attitude”
Fatigue
Task acceptance
Excessive hours/Shortcuts taken
Tool partially hidden by equipment
Failed to notice or remember tool
Checklist sign off/Tool inventory
Checklists/Shortcuts

HFACS-ME Categories

Inadequate Processes
Inadequate Documentation
Inadequate Resources
Inadequate Supervision
Inappropriate Operations
Mental State
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Assertiveness
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Obstructed
Attention/Memory
Judgment/Decision Making
Routine Violation (not the 1st time)

Note: Why not aircraft design and confining work areas? The problem was the misplaced tool, not that the mechanic couldn't accomplish the task of maintenance within that space.

As you can see, HFACS-ME classification allows more specific intervention strategies to be implemented at the organizational, local supervisory, and shop floor levels.



Break!

Break!